

Precursor to flora account of *Procris* (Urticaceae) in Peninsular Malaysia

Barry J. Conn¹ and Julisasi T. Hadiah²

¹National Herbarium of New South Wales,
Mrs Macquaries Rd, Sydney NSW 2000, Australia
barry.conn@rbgsyd.nsw.gov

²Pusat Konservasi Tumbuhan, Kebun Raya Bogor,
Jl. Ir. H. Juanda 13, Bogor 16122, Indonesia

ABSTRACT. A review of *Elatostema* J.R.Forst. & G.Forst. and *Procris* Juss. (Urticaceae) occurring in Peninsular Malaysia resulted in four taxa, currently classified in *Elatostema*, being transferred to the genus *Procris*. Six species of *Procris* are recognised as occurring in Peninsular Malaysia with the following new combinations provided here: *Procris acaulis* (Hook.f.) B.J.Conn & J.T.Hadiah; *Procris curtisii* (Ridl.) B.J.Conn & J.T.Hadiah; and *Procris repens* (Lour.) B.J.Conn & J.T.Hadiah. A modified description of *Procris* (including *Pellionia*) and a key to the species occurring in Peninsular Malaysia are provided.

Keywords. *Elatostema*, *Pellionia*, Peninsular Malaysia, *Procris*, Urticaceae

Introduction

Elatostema is a very large genus that is considered to consist of approximately 300 herbaceous and sub-shrubby species (Friis 1993) that are characterised by having female flowers arranged on a flattened discoid or lobed receptacle. It is the type genus of the Tribe Elatostemateae (Conn & Hadiah 2009). *Elatostema* is widely distributed throughout the tropical, subtropical and sub-temperate regions from the west to east coast of Africa, Madagascar and Mascarene Islands, through Sri Lanka, southern India, tropical Himalaya, Bangladesh, Myanmar to South-East Asia, Micronesia, then throughout Papuasias, to eastern Australia, New Caledonia, northern New Zealand, and Polynesia. It also occurs in subtropical and sub-temperate regions of China, Taiwan and Japan. Since it was first described by Forster & Forster (1775), the taxonomic circumscription of the genus and infrageneric taxa have been problematic. The generic description includes features of what is now regarded as the separate genus *Procris*. In the protologue of *Elatostema*, the species *Elatostema pedunculatum* and *E. sessile* were described. *Elatostema pedunculatum* was circumscribed as having flowers with 5 stamens ('pentandrum'), whereas the flowers of *E. sessile* have 4 stamens ('tetrandrum'). The former species was later transferred to the genus *Procris* (Weddell 1856), whereas the latter remained in *Elatostema*. Furthermore, the taxonomic distinction of the related taxa, *Elatostematoides*, *Pellionia* and *Procris* has continued to be problematic.

The first, and most complete account of the taxonomy of *Elatostema* was provided by Schröter & Winkler (1935, 1936). They modified the subgeneric division of previous workers (Hallier 1896, Winkler 1922) and proposed four subgenera, namely, subg. *Elatostema* (as ‘*Enelatostema*’), subg. *Elatostematoides*, subg. *Pellionia*, and subg. *Weddellia*. This division was primarily based on the nature of the leaves, stipules, inflorescence and the presence and form of the receptacle. Some authors maintain *Pellionia* as a distinct genus, for example, Wang (1980); Yahara (1984); Chen et al. (2003). The latter authors circumscribed *Pellionia* as having cymose female inflorescences, rarely with discoid receptacle and involucre, whereas the female inflorescences of *Procris* are capitate or globose and lack an involucre. Furthermore, the female flowers of *Pellionia* have (4 or) 5 perianth lobes, whereas female flowers of *Procris* have 3 or 4 perianth lobes. Schröter & Winkler (1935, 1936) recognised *Procris* as a separate genus. Based on chloroplast sequence data, preliminary analyses of relationships within *Elatostema* do not support the recognition of the subgenus *Pellionia* (Hadiah et al. 2003). Hadiah et al. (2008) concluded that there are four genera within the Tribe Elatostemateae, namely *Elatostema*, *Lecanthus*, *Pilea* and *Procris*, with *Pellionia* reduced to the synonymy of the last mentioned genus.

Materials and methods

Herbarium collections held at BO, K, KEP, NSW, SING were examined. Descriptive data are managed by DeltaAccess 2.0 software (Hagedorn 2007 onwards).

An identification key to the genera of the tribe *Elatostemateae* occurring in Peninsular Malaysia is provided. A brief description of *Procris* and a key to species recognised for Peninsular Malaysia, together with a list of selected specimens examined, are provided.

Distinguishing features of *Elatostema* and *Procris*

The following key summarises the diagnostic features of the genera of tribe *Elatostemateae* that occur in Peninsular Malaysia, namely, *Elatostema*, *Pilea* and *Procris* (including *Pellionia*).

Key to genera of tribe Elatostemateae

- 1a. Leaves opposite, more or less isophyllous; lamina $\pm$ equal basally; venation 3-plinerved *Pilea*
- 1b. Leaves appearing alternate, anisophyllous, with nanophyll reduced, and usually soon caduous; lamina very unequal basally; venation pinnate 2

- 2a. Perianth lobes of female flowers usually 4 or 5, much shorter than ovary, or strongly reduced, not corniculate at apex; achene 6–10-ribbed; male inflorescences usually with receptacle, rarely cymose; receptacle of female inflorescences discoid *Elatostema*
- 2b. Perianth lobes of female flowers 3–5, longer than ovary, usually corniculate below apex; achene tuberculate or striate, rarely smooth, never ribbed; male inflorescences cymose; receptacle of female inflorescences globose or head-like .. *Procris*

Species of *Procris* in Peninsular Malaysia

In the account of the Urticaceae for the Malay Peninsula by Ridley (1924), four species of *Pellionia*, five species of *Elatostema* and two species of *Procris* were recognised. Turner (1995) provided an updated catalogue of species of Urticaceae that were reported to occur in this region. In his catalogue, he listed 11 species of *Elatostema* (including taxa previously recognised as belonging to *Pellionia*) and two species of *Procris*. In this review of Turner's list of species for these two genera, four species listed as *Elatostema* are here transferred to *Procris*, resulting in six species being recognised for this region.

Procris Commers. ex Juss., *Genera Plantarum* 403 (1789); Schröter, *Repertorium Specierum Novarum Regni Vegetabilis* 45: 179–192 and 257–300 (1938), partly revised.

TYPE SPECIES: *Procris axillaris* J.F.Gmel., *Systema Naturae* 2: 267 (1791).

Shrubs, self-supporting (erect/suberect), terrestrial or epiphytic, monoecious or dioecious; branched and stinging hairs absent; internodes elongate, distinct. Stipules caducous, free, axillary, intrapetiolar. Leaves subopposite to alternate, petiolate; lamina not lobed; base oblique; margin toothed or entire; apex variable, leaf surface glabrous or hairy; venation symmetric, secondary vein pinnate. Nanophylls present, often not persistent. Cystoliths linear. Flowers unisexual. Male inflorescences distinctly pedunculate, paniculate (usually openly branched), branching unordered; involucre bracts absent. Male flowers actinomorphic; tepals 4 or 5, free; stamens 4 or 5, inflexed; rudimentary ovary present. Female inflorescences pedunculate or sessile, head-like (condensed); involucre bracts absent. Female flowers actinomorphic (or slightly asymmetrical); tepals 3–5, equal, connate (at least in part); staminodes present; ovary straight; style absent; stigma oblong, filiform to linear. Achene enclosed by perianth (or almost so) or not enclosed by perianth, smooth or variously rough.

Distribution. Central western and eastern Africa, Madagascar to Sri Lanka and India, Myanmar, southern China, Taiwan, throughout South-East Asia, Papua New Guinea, Solomon Islands, New Caledonia, and east throughout south-west Pacific islands.

Key to species of *Procris* in Peninsular Malaysia

- 1a. Leaf petiolate 2
- 1b. Leaf sessile or subsessile 5
- 2a. Nanophyll appearing absent, not persistent, soon dehiscent 3
- 2b. Nanophyll present and persistent *Procris latifolia*
- 3a. Leaf margin entire or sometimes slightly toothed or wavy near apex 4
- 3b. Leaf margin toothed (dentate, serrate or crenate) *Procris frutescens*
- 4a. Leaves (megaphylls) ovate; venation asymmetric, 2- or 3-plinerved, secondary veins faint but usually distinct; petiole hairy *Procris acaulis*
- 4b. Leaves (megaphylls) oblong-elliptic; venation symmetric, pinnate, secondary veins inconspicuous; petiole glabrous *Procris pedunculata*
- 5a. Nanophylls present and persistent; leaf (megaphyll) broadly ovate; margin with rounded teeth; venation actinodromous; male inflorescence openly branched
..... *Procris repens*
- 5b. Nanophylls absent; leaf (megaphyll) narrowly ovate-elliptic; margin obscurely toothed; venation pinnate; male inflorescence more or less compact with closed branching *Procris curtisii*

Note. The synonyms cited are only those that apply to Peninsular Malaysia.

1. *Procris acaulis* (Hook.f.) B.J.Conn & J.T.Hadiah, *comb. nov.*

Basionym: *Pellionia acaulis* Hook.f., *Flora of British India* 5: 562 (1888). Synonyms: *Pellionia javanica* Wedd. var. *acaulis* (Hook.f.) Ridl., *J. Straits Br. Roy. Asiat. Soc.* 59: 187 (1911); *Elatostema latifolium* Blume var. *acaulis* (Hook.f.) H.Schroeter, *Repert. Spec. Nov. Regni Veg. Beih.* 83(2): 17 & 1935 (1936). TYPE: Malaysia, Penang, on damp rocks, *King's Collectors* 1659, May 1881 (K).

Distribution. Peninsular Malaysia, Cambodia.

Selected specimens examined: PENINSULAR MALAYSIA. **Perak:** Temango, *Ridley* 14560, Jul 1909 (SING). **Penang:** refer Type above.

2. *Procris curtisii* (Ridl.) B.J.Conn & J.T.Hadiah, *comb. nov.*

Basionym: *Pellionia curtisii* Ridl., *J. Straits Br. Roy. Asiat. Soc.* 82: 196 (1920). Synonym: *Elatostema curtisii* (Ridl.) H.Schroeter, *Repert. Spec. Nov. Regni Veg. Beih.* 83(2): 35 (1936). TYPE: Malaysia, Perak, Gunung Bajong, Malacca am Kantafluß, *Curtis s.n.*, Aug 1898 (SING).

Distribution. Peninsular Malaysia, Thailand, Philippines, Indonesia, Papua New Guinea, Solomon Islands.

Selected specimens examined: PENINSULAR MALAYSIA. **Perak:** Lenggong, Ridley s.n., Aug 1909 (SING124283). **Selangor:** Gua Batu, Ridley 4717, 23 Jun 1889 (SING124284); 8196, Dec 1898 (SING124286).

3. *Procris frutescens* Blume, *Bijdr.* 510 (1825–1826); H.Schroeter, *Repert. Spec. Nov. Regni Veg.* 45: 272 (1938), *descr. ampl.* TYPE: Indonesia, Java, Blume 707, without date (L).

Distribution. Peninsular Malaysia, Thailand, Philippines, Indonesia, Papua New Guinea, Solomon Islands.

Selected specimens examined: PENINSULAR MALAYSIA. **Perak:** Larut and Matang, Maxwell Hill, Burkill 12686, 6 Mar 1924 (SING124847). **Kelantan:** Gua Musang, Batu Papan, Kiew 2882 & Anthonyamy, 9 May 1990 (SING124843). **Pahang:** Cameron Highlands, Boh Plantation, Mohd Nur 32746, 26 Apr 1937 (SING124838). **Johor:** Mawai–Jemaluang road, Corner 32461, 11 Oct 1936 (SING124839 & 124840).

4. *Procris latifolia* Blume, *Bijdr.* 10: 509 (1825).

Pellionia latifolia (Blume) Boerlage, *Handl.* 3: 375 (1900). *Elatostema latifolium* (Blume) H.Schroeter, *Repert. Spec. Nov. Regni Veg. Beih.* 83(2): 17 & 1935 (1936). TYPE: Indonesia, Java, Res. Bantam, Sadjira, Blume s.n. (B, BO, BRSL, L).

Pellionia helferiana Wedd., *Prodr. Syst. Nat. Regni Veg.* 16(1): 170 (1869); *Elatostema helferianum* (Wedd.) Hallier f., *Ann. Jard. Bot. Buitenzorg* 13: 316 (1896). TYPE: Andaman, Helfer 4551 (K).

Pellionia javanica Wedd., *Arch. Mus. Hist. Nat.* 8: 288 (1856); *Elatostema javanicum* (Wedd.) Hallier f., *Ann. Jard. Bot. Buitenzorg* 13: 316 (1896). TYPE: Indonesia, Java, Lobb 283, anno 1846 (K, W).

Distribution. Peninsular Malaysia, Myanmar, Vietnam, Thailand, Indonesia.

Selected specimens examined: PENINSULAR MALAYSIA. **Kedah:** Langkawi, Selat Panchor Henderson 29083, 23 Nov 1934 (SING124292). **Penang:** Plant House no. 1, Mohd Nur s.n., 23 Sep 1918 (SING124293); Balik Pulau, Curtis 682, Mar 1886 (K, SING124303 & 124304). **Perak:** Kuala Kangsar: Padang Rengas, Burkill 13580, 15 Jun 1924 (SING124295); Gunong Bubu, Chew 1220, 18 Aug 1966 (SING124298); Tapah, Jor, Mohd Haniff 14253, 15 Sep 1924 (SING124312). **Kelantan:** Gua Musang, Henderson 22693, 13 Aug 1929 (SING124307); Henderson 19503, 21 Oct 1927 (SING124311). **Selangor:** Kuala Lumpur, Batu Caves, Ternya 498, 20 Jan 1929

(SING124291); *Ridley* 13370, Aug 1900 (SING124322). **Pahang**: Tioman, Juara Bay, *Burkill* s.n., Jun 1915 (SING124296 & 124297); Jerantut: Gunung Tahan, *Mohd Haniff* 10197 & *Mohd Nur*, 21 Jun 1922 (SING124314). **Malacca**: Bukit Naning, *Alvins* 1105, 26 Mar 1885 (SING124294). **Johor**: Gunung Sumalayang, *Chin* 597, 3 Feb 1971 (SING124300); Sungai Segun, *Corner* 30694, 10 Apr 1936 (SING124301 & 124302); Labis, Sungai Juasseh, *Mohd Shah* 2287 & *Ahmad*, 31 Jan 1971 (SING124317).

5. *Procris pedunculata* (J.R.Forst. & G.Forst.) Wedd., in DC. *Prodr.* 16: I, 191 (1869); H.Schroeter, *Repert. Spec. Nov. Regni Veg.* 45: 259, (1938) (emend., as *P. pedunculata* var. *enpedunculata*).

Basionym: *Elatostema pedunculata* J.R.Forst. & G.Forst., *Characteres Generum Plantarum*, 53 (1775). LECTOTYPE (designated by Smith 1981): Society Islands (Tahiti), *J.R. Forster* s.n., (K; isoelectotype MW).

Distribution. Peninsular Malaysia, Marquesas Islands, Philippines, Indonesia, Papua New Guinea, Solomon Islands, Christmas Islands; Cook Islands; Fiji; Society Islands.

Selected specimens examined: PENINSULAR MALAYSIA. **Perlis**: Titi Tinggi, Mata Ayer Forest Reserve, *Kiew* 3702, 1 Jul 1993 (SING124852). **Kelantan**: Gua Musang, *Kiew* 2992, 15 May 1990 (SING124851).

6. *Procris repens* (Lour.) B.J.Conn & J.T.Hadiah, *comb. nov.*

Basionym: *Polychroa repens* Lour., *Fl. Cochinchinensis* 2: 559 (1790). *Synonyms:* *Elatostema repens* (Lour.) Hallier f., *Ann. Jard. Bot. Buitenzorg* 13: 316. (1896); *Pellionia repens* (Lour.) Merr., *Lingnan Sci. J.* 6(4): 326 (1928). TYPE: unknown – taxonomic concept applied here is based on the amplified concept of Schröter & Winkler (1935).

Pellionia daveanana N.E.Br., *Gard. Chron.* 1880(2): 262 (1880). TYPE: Vietnam, Phugnoe, *G. Lebenf* s.n., without date (K).

Distribution. Peninsular Malaysia, Thailand, Philippines, Indonesia.

Notes. Schröter (in Schröter & Winkler 1935) recognised three varieties within '*Elatostema repens*'; however, the taxonomic status of these taxa have not been evaluated here.

Selected specimens examined: PENINSULAR MALAYSIA. **Perlis**: Gua Burma, *Kiew* 3655, 28 Jun 1993 (SING124791). **Kedah**: Baling, Kedah Peak, *Curtis* s.n., without date (SING124785). **Penang**: *Curtis* s.n., without date (SING124782–124784); Plant House no. 9, *Mohd Nur* s.n. 24 Sep 1918 (SING124798). **Perak**: *Scortechini* 485, without date (K); Hulu Perak, Grik, *Burkill* 12545 & *Mohd Haniff*, 19 Jun 1924 (SING124779); Kuala Kangsar, Kota Lama, *Mohd Haniff* 15528, 20 Oct 1924

(SING124796). **Kelantan:** Gua Ninik, *Henderson 19690*, 26 Oct 1927 (SING124788); Sungai Ketil, *Henderson 22665*, 12 Aug 1929 (SING124789); Sungai Bring, *Kiew 2904*, 11 May 1990 (SING124790). **Selangor:** Gombak, Batu Caves, *Ridley 8186*, Dec 1896 (SING124800); Kepong, *Symington 25169*, 29 Jul 1931 (SING124806). **Pahang:** Bentong, *Burkill 16533 & Mohd Haniff*, 6 Nov 1924 (SING124777); Raub, Gali, *Burkill 16839 & Mohd Haniff*, 13 Nov 1924 (SING124778). **Negeri Sembilan:** Bukit Sutu, *Alvins 1962* 1 Nov 1885 (SING124775); Tampin, *Burkill 2515*, 14 Jul 1917 (SING124776).

ACKNOWLEDGEMENTS. We acknowledge the generous support given to us by the Singapore Botanic Gardens Visiting Research Fellowship in 2009.

References

- Chen, J., Lin, Q., Friis, I., Wilmot-Dear, C.M. & Monro, A.K. (2003) Urticaceae. In: Wu, Z.Y., Raven, P.H. & Hong, D.Y. (eds) *Flora of China*, vol. 5 (*Ulmaceae through Basellaceae*), pp. 76–189. Beijing & St. Louis: Science Press & Missouri Botanical Garden Press.
- Conn, B.J. & Hadiyah, J.T. (2009) Nomenclature of tribes within the Urticaceae. *Kew Bull.* 64(2): 349–352.
- Forster, J.R. & Forster, G. (1775) 53. *Elatostema*. *Characteres Generum Plantarum*. London: B. White, T. Cadell & P. Elmsly.
- Friis, I. (1993) Urticaceae. In: Kubitzki, K., Rohwer, J.G. & Bittrich, V. (eds), *The Families and Genera of Vascular Plants II, Flowering Plants – Dicotyledones. Magnoliid, Hamamelid and Caryophyllid Families*, vol. II, pp. 612–630. Berlin: Springer-Verlag.
- Hadiyah, J.T., Conn, B.J. & Quinn, C.J. (2008) Infra-familial phylogeny of Urticaceae, using chloroplast sequence data. *Austral. Syst. Bot.* 21(5): 375–385.
- Hadiyah, J.T., Quinn, C.J. & Conn, B.J. (2003) Phylogeny of *Elatostema* (Urticaceae) using chloroplast DNA data. *Telopea* 10(1): 235–246.
- Hagedorn, G.M. (2007 onwards) DiversityDescriptions. Available at <http://www.diversityworkbench.net/Portal/DiversityDescriptions> (verified 10 Mar 2011).
- Hallier, H. (1896) Neue und bemerkenswerte pflanzen aus dem malaiischpapuanischen inselmeer. *Ann. Jard. Bot. Buitenzorg* 13: 276–326.
- Ridley, H.N. (1924) Urticaceae. In: *The Flora of the Malay Peninsula*, vol. 3 – *Apetalae*, pp. 317–368. London: L. Reeve & Co.
- Schröter, H. & Winkler, H. (1935) Monographie der gattung *Elatostema* s.l.: Allgemeiner teil. *Repert. Spec. Nov. Regni Veg.* 83(1): 1–71.
- Schröter, H. & Winkler, H. (1936) Monographie der gattung *Elatostema* s.l.: Spezieller teil. *Repert. Spec. Nov. Regni Veg.* 83(2): 1–237.

- Smith, A.C. (1981) Urticaceae. In: Smith, A.C. (ed) *Flora Vitiensis Nova*, vol. 2, *Angiospermae: Dicotyledones, Families 44–116*, pp. 209–251. Hawaii: Pacific Tropical Botanical Garden.
- Turner, I.M. (1995) A catalogue of the vascular plants of Malaya (Urticaceae). *Gard. Bull. Singapore* 47(2): 491–493.
- Wang, W.T. (1980) Classificatio specierum Pellionae (Urticaceae). *Bull. Bot. Lab. N. E. Forest. Inst., Harbin* 6: 45–66.
- Weddell, H.A. (1856) Monographie de la famille des Urticées. *Nouv. Arch. Mus. Hist. Nat.* 9: 1–400.
- Winkler, H. (1922) Die Urticaceen Papuasien. *Beitr. Fl. Papuasien* 8: 501–608.
- Yahara, T. (1984) *Pellionia* and *Elatostema* in Thailand (Taxonomic studies of Urticaceae II). *J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot.* 13(4): 483–499.